High-Resolution Imaging Demonstration Project
Cape Girardeau, Missouri
Olmstead Lock and Dam, Kentucky
18 March 2002

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Dr. Charles R. Welch, ITL Technical Director
Dr. Tony Liu, HQ Technical Monitor

A demonstration of the applications of a high-resolution acoustical imaging camera (HRAIC) occurred during the week of 18 March 2002 at Cape Girardeau, Missouri, and Olmstead Lock and Dam in Kentucky.

The HRAIC was first demonstrated at Cape Girardeau, Missouri, on 20 March 2002 and then at Olmstead Lock and Dam on 21 of March 2002. The purpose of the demonstration was to display the capabilities of a DIDSON sonar acoustic camera to personnel from the St. Louis and Louisville Districts, U.S. Army Corps of Engineers, and to provide feedback from the field to the U.S. Army Engineer Research and Development Center (ERDC). The demonstration was funded under The Innovative Navigation Program (INP.)

On the morning of 19 March 2002, District and ERDC personnel assembled at the Mississippi River dock near the new bridge in Cape Girardeau for the demonstration project. Those attending the demonstration were as follows:

- Billy Arthur – St Louis District
- Kevin Slattery -St Louis District
- Joe Burnett- St Louis District
- Randy Trout - St Louis District
- Boat Captain
- First Mate
- Byron McClellan - Louisville District
- Bob Willis - Louisville District
- Terry Warren – ERDC- Vicksburg
- Lewis Smithhart – ERDC- Vicksburg

An improved mount, which had been developed for the camera at ERDC Vicksburg, was attached to the boat. This provided a considerable improvement in performance over the method of deployment that had been used in the first demonstration at Vicksburg, Mississippi, in August 2001.

Due to the high-water condition of the Mississippi River, it was not possible to image some structures at both Cape Girardeau and Olmstead as had originally been planned. However, some images were obtained at both sites. Examples of these are shown in the

attached figures. The underwater acoustical image of a ridged casing is shown in Figure 1 and the visual image is shown in Figure 2. Figures 3 and 4 compare the images obtained by both acoustics and a visual camera of bolts located on wing plates. Figures 5 and 6 emphasize the need to ensure the camera is positioned with the proper grazing angle of the beam. Other figures show the resolution that can be obtained for environmental applications such as biological species identification.

The results of the demonstration project emphasized (as did the first demonstration) that the high-resolution imaging system has the potential of being an extremely useful technology for Corps of Engineers mission areas after further development. Further development will include the following:

- A stable and independent (of boat motion) method of deployment (critical).
- Methods to further stabilize the image electronically.
- Methods to reduce the noise level by providing additional processing.
- A remote method of moving the direction of the camera (joy stick) located near the display. (In general make the system more user friendly).

We appreciate the support for this project provided by Dr. Stanley Woodson, GSL.

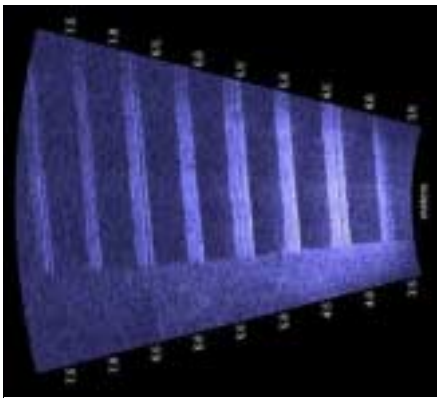


Figure 1. Acoustical image of lower part of ridged casing

Figure 2. Photograph of upper part of ridged casing

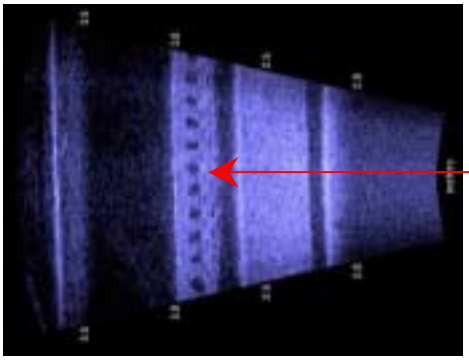


Figure 3. Acoustic image of casing end-plate

Figure 4. Photographic image of casing end-plate

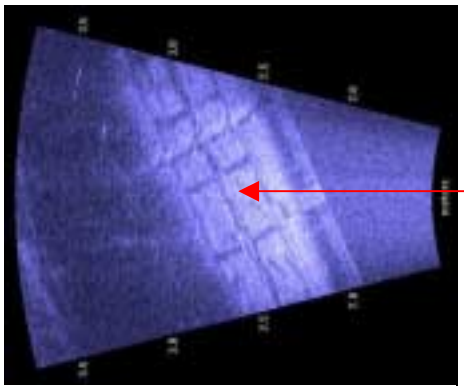


Figure 5. Acoustical image of ladder

Figure 6. Photographic image of ladder

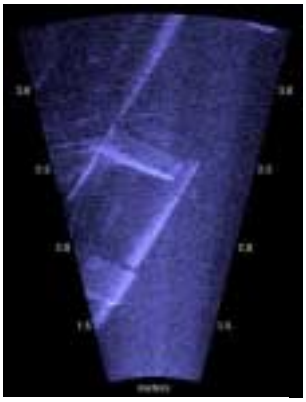
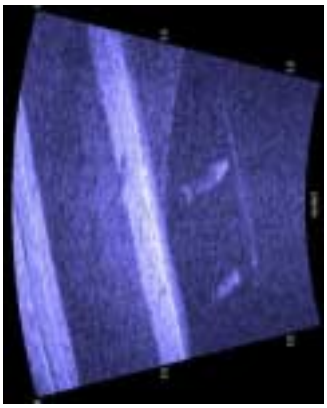


Figure 7. Acoustical image of a mooring



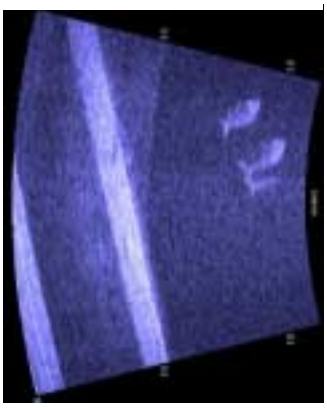


Figure 8. Acoustical image of several fish moving adjacent to a casing

The high-resolution acoustical program now has an ftp server where both AVI and still images from the latest demonstration projects may be viewed or downloaded. To download or view the acoustic camera videos and pictures from the FTP server, do the following:

1. Open your Web browser.

2. Type ftp://ftp.erdc.usace.army.mil/pub/outgoing/acimages into your browser's address line.

3. You should see a folder or directory named Videos. Double-click it if you are using Internet Explorer (IE). Single-click it if you are browsing with Netscape.

4. You will see several other folders (directories). Click or double-click, depending on your browser, on the directory you are interested in.

5. This will bring up a list of files that are in the directory. The files can be viewed inside the browser, or they can be downloaded to your computer. For example, in IE double-clicking a file will give the user the option of viewing inside the browser or downloading to your computer. Also in IE a file can be downloaded by right-clicking the file and selecting “Copy to Folder” from the popup menu. In Netscape, clicking the file will give you the option of “Saving to Disk” or viewing. A file can also be downloaded from Netscape by right-clicking the file and selecting “Save Link As” from the popup menu. NOTE: Some of the video (*.avi) files are rather large and may take several minutes to download. Length of download time depends on the speed of the connection.

If problems occur, please contact Mr. Terry W. Warren, CEERD-IJ-O
(601) 634-2690

From: Arthur, Billy R MVS
Sent: Wednesday, March 20, 2002 9:06 AM
To: Strauser, Claude N MVS; Evans, James A ERDC-ITL-MS; Baldus, Melvin W JR MVS; Busse, David R MVS; Arthur, Billy R MVS; Slattery, Kevin P MVS; Keim, James L MVS; Strauser, Bradford M MVS
Subject: Acustoical Camera Demo-Cape and Olmsted

It is still gong on -high stages at Olmsted, over the lock wall, may limit what can be viewed, and as I will be out of the office til 1 april, wanted to give bullett summary while fresh on my mind.

-CAmera, technical rep, plus WES folks and St. Louis District folks all met at Cape to shake out demo around the new bridge construction across the Mississippi River at Cape. New piers in the middle of the river, sheet pile deflector, caissons and spud frames were all available to look at. On a wet and cold day we used the good folks in ED-S on the Simpson and Joe Burnett from the Boyer to asssit in getting the camera in the water.

Summary of what we saw. The camera will image in the River at CApe. It is difficult to hold positin and give the camera the needed few minutes to properly image. Over near shore where we could position with 2 meters and hold position, we got very detailed imaging at Missouri Dry Dock, pontoon barges that had damage below water line. Even saw fish swimming in and out of the frame. We can image in the dirty water on our inland navigation areas.

Byron McClellan and Bob Willis (ORD folks) were able to view the camera results before driving on the WES. They were pleased with the Mo dry dock imaging.

Ohio River rose quickly over the last couple of days and is over the lock walls this morning 20 March. The features we wanted to image around the lock may be to deep to get a good view. They will give it a try unless debris or positioning difficulty stops them.

It was a good learning curve and in my mind will send us forward toward 3 more goals:

-Refine and hope for better conditions at Olmsted in May when we have both boats at site for other scheudled work.
-Louisville has a rehab-stilling basin damage and perhaps a lock problem that would give controlled conditions for camera imaging that they will consider after this Cape effort.
-AS most of us guessed, the deploying of the camera and protecting it from floating debris is the biggest hurdle to overcome. How to get the camera in position and keep it there. WE have some ideas and do want Mr. Evans and the camera reps to put us in touch with other camera purchasers that have figured out deploying methods for their uses. That should stimilate something that will work.

It is a start and does prove that the camera will work in our river conditions. Now the tough part of putting and keeping the camera in the right place to do its work. Its never easy or someone else would be doing it.

Billy Arthur
ED-HQ